Table 3-4: Interference Level at Spaceway Satellite (with 6 dB transmit power reduction)

Criteria		Calculated InterferenceLevel	
Time Percentage	Interference Level	Same polarization /Odyssey	Opposite polarization/Odyssey
		Satellite # 2 101° W.L.	Satellite # 2 101° W.L.
0.87%	$I=0.06N_T$	- -	--
0.119%	$I=0.78N_T$	$I=0.49N_T$	$I=0.12N_T$
0.0294%	$I=2.98N_T$	$I=0.68N_T$	$I=0.17N_T$
0.0004%	$I=14.8N_T$	$I=0.68N_T$	$I=0.17N_T$

Based on the foregoing, we can make the following statements:

* Operation on opposite polarization with the Odyssey system: the level of interference at the Spaceway satellites would be well below the recommended levels.

** The Odyssey feeder link earth station at Portland and Spaceway satellite #2 can acceptably operate on the opposite polarization.

* In order for the Odyssey feeder link earth station at Portland to operate on the same polarization with Spaceway satellite #2, Odyssey would either have to reduce power by up to 6 dB or, if practical, switch traffic to an alternate earth station during the in-line interference period. Similar techniques would be available to Odyssey to mitigate other cases of excess interference to GSO FSS satellites in the US and around the world.

3.1.2 Potential Interference At The Odyssey Satellites

3.1.2.1 Spaceway Interference Into Odyssey

The interference level at the Odyssey satellites caused by the Spaceway 0.66 m VSAT users associated with Spaceway satellites # 2 (101° W.L) is

summarized in Tables 3-6 and 3-7. Table 3-6 summarizes the calculated interference levels at the Odyssey satellites. To meet the recommended interference level, the interference level at the Odyssey satellite must be reduced by the amount shown in Table 3-7.

Table 3-6: Interference Level At The Odyssey Satellites

Criteria		Calculated InterferenceLevel	
Time Percentage	Interference Level	Same polarization /Odyssey	Opposite polarization/Odyssey
		Satellite #2 101° W.L.	Satellite #2 101° W.L.
0.87%	$I=0.06N_T$	- -	--
0.119%	$I=0.78N_T$	$I=1.23N_T$	$I=0.34N_T$
0.0294%	$I=2.98N_T$	$I=2.61N_T$	$I=0.36N_T$
0.0004%	$I=14.8N_T$	$I=2.61N_T$	$I=0.36N_T$

Table 3-7: Required Interference Reduction

Criteria		Calculated InterferenceLevel	
Time Percentage	Interference Level	Same polarization /Odyssey	Opposite polarization/Odyssey
		Satellite #2 117° W.L.	Satellite #2 117° W.L.
0.87%	$I=0.06N_T$	- -	- -
0.119%	$I=0.78N_T$	$I=1.97N_T$	- -
0.0294%	$I=2.98N_T$	- -	- -
0.0004%	$I=14.8N_T$	- -	- -

From Table 3-7, we conclude that if the Odyssey system operates on opposite polarization with Spaceway system, then the level of interference at the Odyssey satellites is well below the recommended level. However, if both systems operate on the same polarization, then the interference level at the

Odyssey satellite is 1.97 dB (worst case) higher than the recommended value as shown in Table 3-7.

All the above calculations are based on -59.4 dBW/Hz power density into the 0.66 m antenna of Spaceway user terminal. If the power density is limited to -61 dBW/Hz into the antenna during the interference period, then the interference level at the Odyssey satellites would be reduced to the recommended levels.

3.1.2.2 GSO FSS "Spaceway" - Type Satellite at 117° W.L. Interference into Odyssey

If, for example, a GSO FSS satellite of the Spaceway design with VSAT (0.66 m terminal antenna) users were to be located at 117° W.L., the interference case would be very different. At 117° W.L., an Odyssey satellite would cross directly in front of the GSO FSS satellites. See Figure 3-4. Tables 3-8 and 3-9 summarize the calculated interference levels from VSAT terminal users at the Odyssey satellite, and show the degree by which the interference level must be reduced.

Table 3-8: Interference Level At The Odyssey Satellites

Criteria		Calculated InterferenceLevel	
Time Percentage	Interference Level	Same polarization /Odyssey	Opposite polarization/Odyssey
		Satellite 117° W.L.	Satellite 117° W.L.
0.87%	$I=0.06N_T$	- -	--
0.119%	$I=0.78N_T$	$I=8.41N_T$	$I=0.36N_T$
0.0294%	$I=2.98N_T$	$I=61.5N_T$	$I=0.36N_T$
0.0004%	$I=14.8N_T$	$I=61.5N_T$	$I=0.36N_T$

Table 3-8 shows that for same polarization operation, the interference level at the Odyssey satellite is 13.14 dB (worst case) higher than the recommended value. A limitation of power density from the Spaceway user terminal does not solve the problem, as the terminal power would have to be reduced in a way that leaves the user without the power to close the link.

Table 3-9: Required Interference Reduction

Criteria		Calculated InterferenceLevel	
Time Percentage	Interference Level	Same polarization /Odyssey	Opposite polarization/Odyssey
		Satellite 117° W.L.	Satellite 117° W.L.
0.87%	$I=0.06N_T$	- -	- -
0.119%	$I=0.78N_T$	I=10.33 dB	- -
0.0294%	$I=2.98N_T$	I=13.14 dB	- -
0.0004%	$I=14.8N_T$	I= 6.18 dB	- -

There are two options available to GSO FSS systems to mitigate interference into Odyssey satellites. First, the GSO FSS operator could prohibit VSAT terminals that operate on the same polarization as Odyssey from operating during periods on in-line interference within a "protection zone" as described in Figure 3-12. With a coastal location (e.g. San Luis Obispo), a substantial portion of the protection zone would fall over the ocean. Second, the GSO FSS operator could employ a frequency plan such as the one described in Section 4.0 below.

Either one or both of these solutions would be available to any GSO FSS operator that locates its satellites in an orbital location that comes within view of an Odyssey earth station tracking an Odyssey satellite as it crosses the geostationary arc.

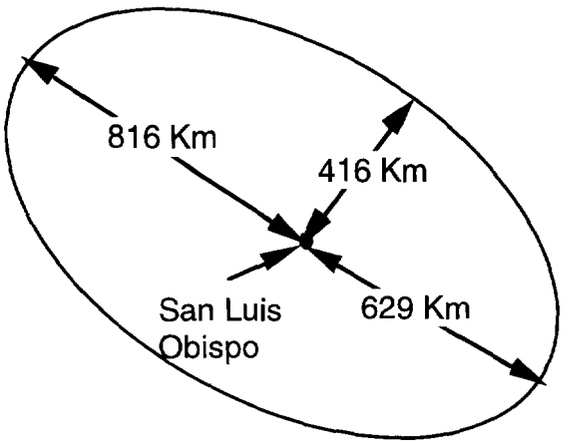


Figure 3-12: The Odyssey earth station at the San Luis Obispo Protection Zone

4.0 Interference Reduction Mechanism

The following proposed frequency scheme would eliminate the potential interference between the Odyssey system and Spaceway system around the world.

* The current proposed band plan for LMDS, FSS and MSS as shown in Figure 4-1

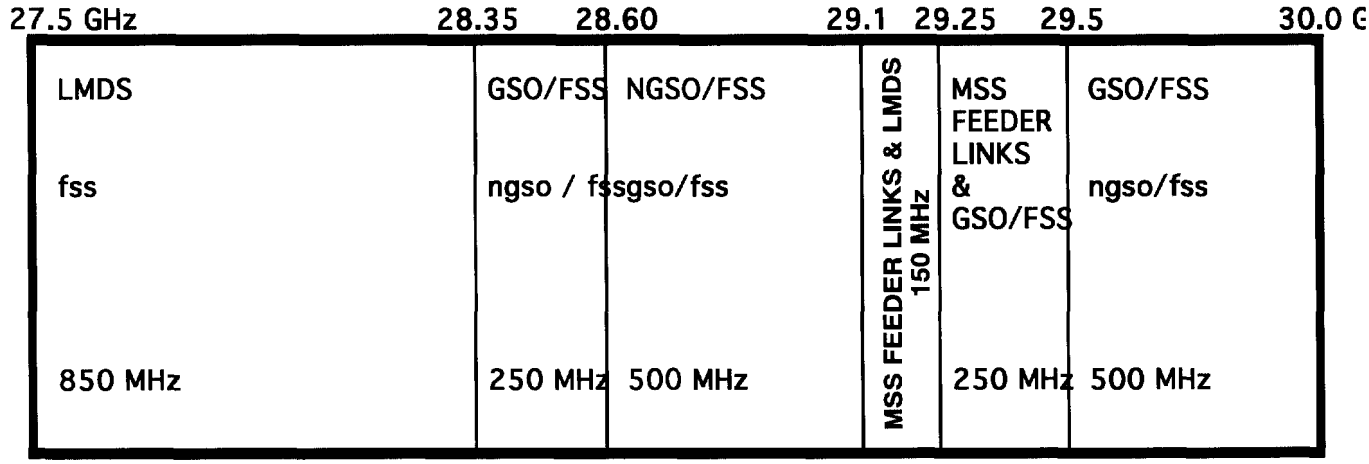


Figure 4-1: FCC Proposed Band Plan For LMDS, FSS and MSS

* Based on the current FCC allocation proposals for 28 GHz, the Spaceway system would use the following frequency plan to eliminate the potential interference with the Odyssey system, as shown in Figure 4-2

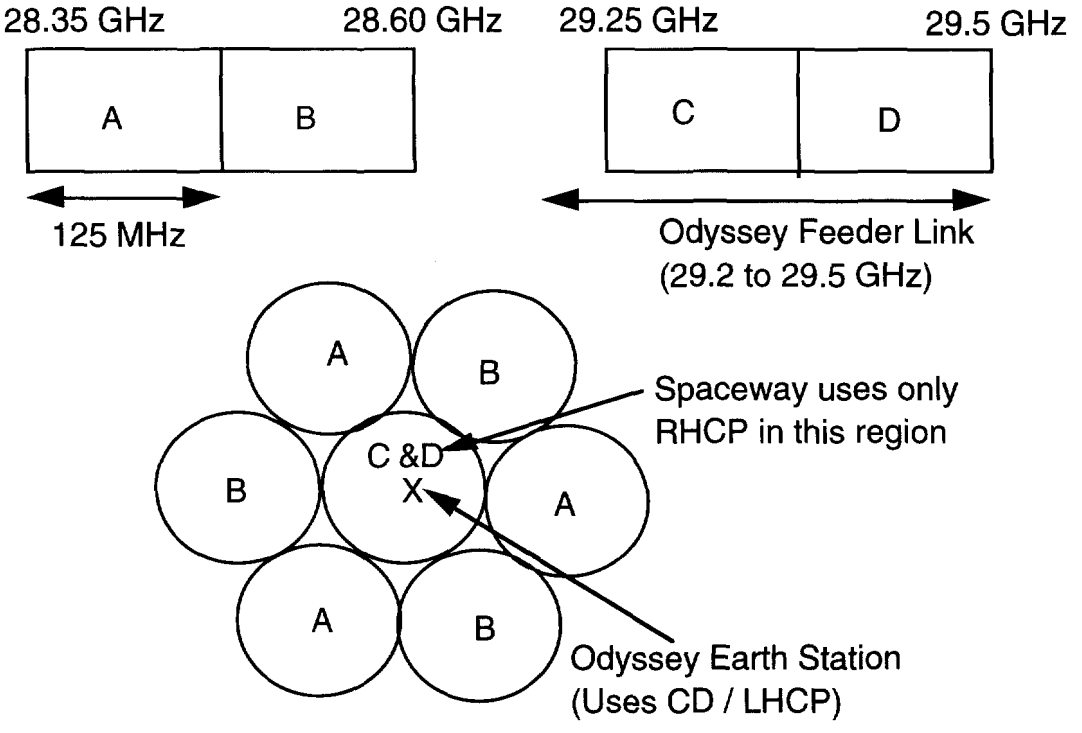
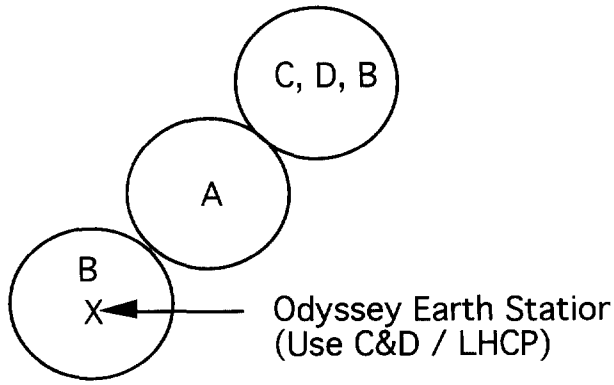


Figure 4-2: Proposed Frequency Plan To Eliminate The Potential Interference

This frequency plan doesn't impact on the system capacity, or service quality of either system. Each Spaceway beam can receive 500 MHz of spectrum, however, each beam only uses 125 MHz (including the guard band) dual polarization. In terms of system capacity, each beam operates 250 MHz.

* However, the coverage antenna patterns for the Spaceway Asia Pacific satellite located at 110° E.L. has 3 beams covering south east of Australia. These beams can operate the following proposed requency plan to eliminate the potential interference. Again, this frequency plan doesn't decrease the Spaceway system capacity or service quality.



5.0 Conclusion

In this study, the sharing situation between the Odyssey NGSO MSS feederlink system and the Spaceway GSO FSS system in the 30/20 GHz was examined. It is demonstrated that the co-direction uplink sharing between the two systems is possible.

The Odyssey system and the Spaceway system (including other GSO systems of similar design) can share the 29.250 - 29.500 GHz uplink band if:

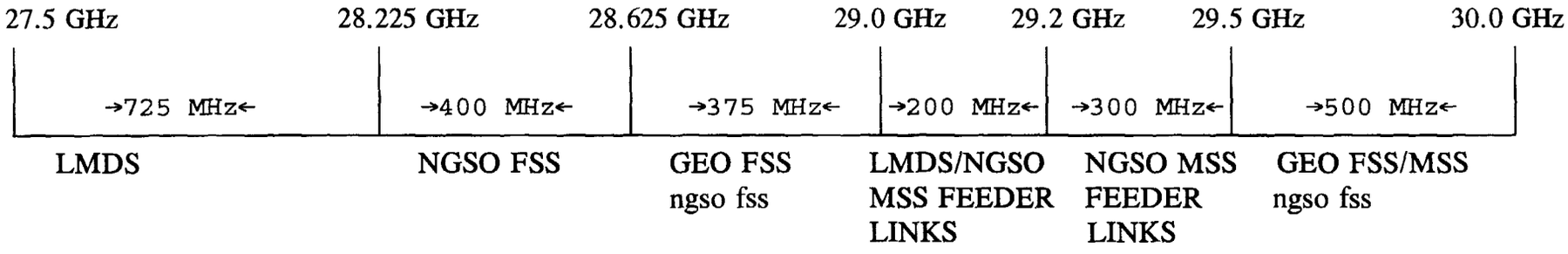
- The two systems operate on different frequencies and/or polarizations when the Odyssey earth station is within the 3 dB antenna contour of the GSO satellite.

- The systems employ spatial separation (on the order of 1000 km or more) if they are to operate on the same frequencies and polarizations.

- The NGSO MSS system operator employs, where practical and as necessary, techniques such as phasing of the satellite constellation, power reduction during in-line events (+/- 0.5°), and traffic management.

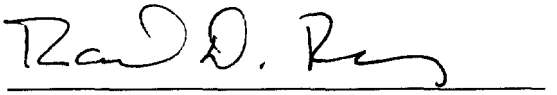
ATTACHMENT 5

TRW SPECTRUM PROPOSAL FOR 27.5-30.0 GHz



TECHNICAL CERTIFICATE

The undersigned hereby certify under penalty of perjury that we are the technically qualified persons responsible for the preparation of the technical material in the foregoing Comments of TRW Inc. and the attachments thereto, and that such material is complete and accurate to the best of our knowledge and belief.



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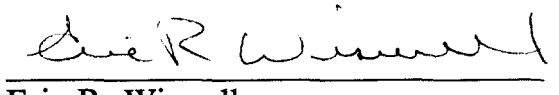

Eric R. Wiswell
Advanced System Manager
Civil & Commercial
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Dated: September 7, 1995

CERTIFICATE OF SERVICE

I, Katharine B. Squalls, hereby certify that a true and correct copy of the foregoing "Comments of TRW Inc." was mailed, first-class postage prepaid, this 7th day of September, 1995, to the following:

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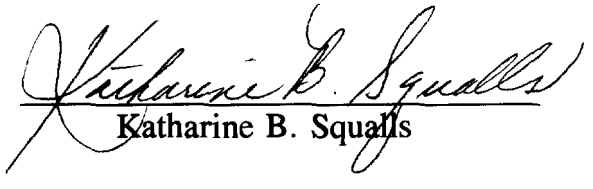

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